

Claims

- [c1] 1. A colored dental or bone polymerizable composition comprising:
 - a resin component;
 - a filler component;
 - a polymerization initiator; and
 - a colored polymerization indicator, wherein:
 - the color intensity of the composition after polymerization is less than the color intensity of the composition before polymerization; and
 - the opacity of the composition after polymerization is less than the opacity of the composition before polymerization.
- [c2] 2. The composition of claim 1, wherein the color intensity of the composition after polymerization and the color intensity of the composition before polymerization correspond to a ΔE of at least about 30.
- [c3] 3. The composition of claim 1, wherein the opacity of the composition after polymerization is less than about 90% of the opacity of the composition before polymerization.
- [c4] 4. The composition of claim 1, wherein the opacity of the

composition after polymerization is less than about 50% of the opacity of the composition before polymerization.

- [c5] 5. The composition of claim 1, wherein the resin component is present at a concentration of about 10 weight percent to about 90 weight percent of the composition.
- [c6] 6. The composition of claim 1, wherein the filler component is present at a concentration of about 10 weight percent to about 90 weight percent of the composition.
- [c7] 7. The composition of claim 1, wherein the resin component comprises a methacrylate monomer, a dimethacrylate monomer, or a multi-methacrylate monomer.
- [c8] 8. The composition of claim 1, wherein the resin component comprises an acrylate monomer, a diacrylate monomer, or a multi-acrylate monomer.
- [c9] 9. The composition of claim 1, wherein the colored polymerization indicator is
6-butoxy-2,4-diiodo-xanthen-3-one,
6-hydroxy-2,4,5,7-tetraiodo-xanthen-3-one, or
6-hydroxy-2,4,5,7-tetraiodo-3-oxo-3H-xanthene-9-carbonitrile.
- [c10] 10. The composition of claim 1, wherein the colored polymerization indicator is present at a concentration of

about 0.001 weight percent to about 1 weight percent of the composition.

- [c11] 11. The composition of claim 1, wherein the polymerization initiator is camphorquinone.
- [c12] 12. The composition of claim 1, wherein the composition before polymerization is a color other than bone color or tooth color.
- [c13] 13. The composition of claim 1, wherein the composition before polymerization is red colored, pink colored, orange colored, green colored, blue colored, or purple colored.
- [c14] 14. The composition of claim 1, wherein the composition after polymerization is tooth colored or bone colored.
- [c15] 15. The composition of claim 1, further characterized as being radio-opaque before polymerization, after polymerization, or both before polymerization and after polymerization.
- [c16] 16. The composition of claim 1, further comprising a fixed dye.
- [c17] 17. The composition of claim 1, further comprising an antioxidant.

- [c18] 18. The composition of claim 1, further comprising a fluoride release agent.
- [c19] 19. The composition of claim 1, further comprising a solvent.
- [c20] 20. The composition of claim 1, further comprising water, ethanol, acetone, or mixtures thereof.
- [c21] 21. A dental or bone polymerized composition prepared by polymerizing an unpolymerized composition comprising:
 - a resin component;
 - a filler component;
 - a polymerization initiator; and
 - a colored polymerization indicator; wherein:
 - the color intensity of the polymerized composition is less than the color intensity of the unpolymerized composition; and
 - the opacity of the polymerized composition is less than the opacity of the unpolymerized composition.
- [c22] 22. The polymerized composition of claim 21, wherein the color intensity of the polymerized composition and the color intensity of the unpolymerized composition correspond to a ΔE of at least about 30.
- [c23] 23. The polymerized composition of claim 21, wherein

the opacity of the composition after polymerization is less than about 90% of the opacity of the composition before polymerization.

- [c24] 24. The polymerized composition of claim 21, wherein the opacity of the composition after polymerization is less than about 50% of the opacity of the composition before polymerization.
- [c25] 25. The polymerized composition of claim 21, wherein the resin component is present at a concentration of about 10 weight percent to about 90 weight percent of the unpolymerized composition.
- [c26] 26. The polymerized composition of claim 10, wherein the filler component is present at a concentration of about 10 weight percent to about 90 weight percent of the unpolymerized composition.
- [c27] 27. The polymerized composition of claim 21, wherein the resin component comprises a methacrylate monomer, a dimethacrylate monomer, or a multi-methacrylate monomer.
- [c28] 28. The polymerized composition of claim 21, wherein the resin component comprises an acrylate monomer, a diacrylate monomer, or a multi-acrylate monomer.

[c29] 29. The polymerized composition of claim 21, wherein the colored polymerization indicator is 6-butoxy-2,4-diodo-xanthen-3-one, 6-hydroxy-2,4,5,7-tetraiodo-xanthen-3-one, or 6-hydroxy-2,4,5,7-tetraiodo-3-oxo-3H-xanthene-9-carbonitrile.

[c30] 30. The polymerized composition of claim 21, wherein the colored polymerization indicator is present at a concentration of about 0.001 weight percent to about 1 weight percent of the unpolymerized composition.

[c31] 31. The polymerized composition of claim 21, wherein the polymerization initiator is camphorquinone.

[c32] 32. The polymerized composition of claim 21, wherein the unpolymerized composition is red colored, pink colored, orange colored, green colored, blue colored, or purple colored.

[c33] 33. The polymerized composition of claim 21, wherein the polymerized composition is tooth colored or bone colored.

[c34] 34. The polymerized composition of claim 21, further comprising a radio-opaque component.

[c35] 35. The polymerized composition of claim 21, further

comprising a fixed dye.

- [c36] 36. The polymerized composition of claim 21, further comprising an antioxidant.
- [c37] 37. The polymerized composition of claim 21, further comprising a fluoride release agent.
- [c38] 38. The polymerized composition of claim 21, further comprising a solvent.
- [c39] 39. The polymerized composition of claim 21, further comprising water, ethanol, acetone, or mixtures thereof.
- [c40] 40. A method of treating a dental or bone substrate, the method comprising:
 - providing the substrate;
 - providing an unpolymerized composition comprising a resin component, a filler component, a polymerization initiator, and a colored polymerization indicator;
 - applying the unpolymerized composition to the substrate; and
 - polymerizing the unpolymerized composition to prepare a polymerized composition, wherein:
 - the color intensity of the polymerized composition is less than the color intensity of the unpolymerized composition; and
 - the opacity of the polymerized composition is less than

the opacity of the unpolymerized composition.

- [c41] 41. The method of claim 40, wherein the substrate is a tooth, a dental implant, an artificial tooth, or a bone.
- [c42] 42. The method of claim 40, wherein the color intensity of the polymerized composition and the color intensity of the unpolymerized composition correspond to a ΔE of at least about 30.
- [c43] 43. The method of claim 40, wherein the opacity of the composition after polymerization is less than about 90% of the opacity of the composition before polymerization.
- [c44] 44. The method of claim 40, wherein the opacity of the composition after polymerization is less than about 50% of the opacity of the composition before polymerization.
- [c45] 45. The method of claim 40, wherein the resin component is present at a concentration of about 10 weight percent to about 90 weight percent of the unpolymerized composition.
- [c46] 46. The method of claim 40, wherein the filler component is present at a concentration of about 10 weight percent to about 90 weight percent of the unpolymerized composition.
- [c47] 47. The method of claim 40, wherein the resin compo-

uent comprises a methacrylate monomer, a dimethacrylate monomer, or a multi-methacrylate monomer.

- [c48] 48. The method of claim 40, wherein the resin component comprises an acrylate monomer, a diacrylate monomer, or a multi-acrylate monomer.
- [c49] 49. The method of claim 40, wherein the colored polymerization indicator is
6-butoxy-2,4-diodo-xanthen-3-one,
6-hydroxy-2,4,5,7-tetraiodo-xanthen-3-one, or
6-hydroxy-2,4,5,7-tetraiodo-3-oxo-3H-xanthene-9-carbonitrile.
- [c50] 50. The method of claim 40, wherein the colored polymerization indicator is present at a concentration of about 0.001 weight percent to about 1 weight percent of the unpolymerized composition.
- [c51] 51. The method of claim 40, wherein the polymerization initiator is camphorquinone.
- [c52] 52. The method of claim 40, wherein the unpolymerized composition is red colored, pink colored, orange colored, green colored, blue colored, or purple colored.
- [c53] 53. The method of claim 40, wherein the polymerized composition is tooth colored or bone colored.

- [c54] 54. The method of claim 40, wherein the unpolymerized composition is radio-opaque, the polymerized composition is radio-opaque, or both the unpolymerized composition and the polymerized composition are radio-opaque.
- [c55] 55. The method of claim 40, wherein the unpolymerized composition further comprises a fixed dye.
- [c56] 56. The method of claim 40, wherein the unpolymerized composition further comprises an antioxidant.
- [c57] 57. The method of claim 40, wherein the unpolymerized composition further comprises a fluoride release agent.
- [c58] 58. The method of claim 40, wherein the unpolymerized composition further comprises a solvent.
- [c59] 59. The method of claim 40, wherein the unpolymerized composition further comprises water, ethanol, acetone, or mixtures thereof.